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U. S. DEPARTMENT OF AGRICULTURE

# FOR INSURANCE AGAINST DROUGHT

## Soil and Water Conservation



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EVERY YEAR some farmers and stockmen in the United States lose money because of drought. The loss is not confined to any one section. The Corn Belt, Cotton Belt, Wheat Belt, western range, and general-farming sections all are damaged by drought at times. Drought may damage crops even on irrigated land and on fields that normally require drainage.

Most areas that have droughts some seasons get more water than is needed during other seasons. Then excess runoff, soil erosion, and floods damage the crops and land. Obviously, some method is needed whereby the wet periods can be balanced against dry periods.

Thousands of farmers and ranchers in this country have found that a well-planned soil and water conservation program helped them prevent damage from drought. This bulletin points out some of the ways this may be done. The conservation practices it advocates have proved successful in all sections of the country to which they are adapted—in every type of climate and on most kinds of land. Thousands of successful farmers recommend these conservation measures for effective drought relief. Properly applied, they are your best insurance against drought.

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# FOR INSURANCE AGAINST DROUGHT—SOIL AND WATER CONSERVATION

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## Are You Prepared for a Drought?

How long will your crops stay green and keep growing if it doesn't rain?

How soon will your pastures begin to dry up? How will it affect the yields of your crops and pastures if you get little or no moisture for several weeks? What if it stays dry for months?

Will the wells and springs on your land keep flowing if it stays dry all summer? What will happen to your farming operations next year if, because of drought, you produce little or nothing this year? Do you



This corn crop in eastern Nebraska was almost a complete failure because of drought. Yet, more than 25 inches of rain and snow fell on the field during the year. This was more than enough moisture to make a good crop if all the water had been saved and used properly.



have feed for your livestock next winter if drought causes the pastures to dry up and the feed crops to fail during the summer and fall?

In other words, are you prepared for a drought?

You can't tell when dry weather will come to your community; nor can you tell how long it will last once it comes. This uncertainty about drought is one of its worst features—you can't get ready for any particular drought, because drought is already with you before you know it is coming. The only thing you can be sure of is that drought will come sometime.

### **What Happened to the Water During the Last Heavy Rain?**

How much water ran off your fields and pastures during the last heavy rain? Was the rain a gully-washer? Did new gullies start on sloping fields or old gullies get deeper, wider, or longer? How much topsoil washed away? Were any crops washed out? Were any crops drowned out or covered with silt on level land at the foot of a hill? Did floodwater rush down the arroyos on your ranch? How much water did your land contribute to floods on the creeks and rivers downstream?

Are you expecting a drought?

If drought does come, your crops and pastures could use the water that ran off your land during the last rain. Moisture stored in the soil is as valuable to growing crops as fresh summer rains.



Much of the water that fell on this Virginia cornfield during a heavy rain in the early summer ran off the field. A late summer drought that year severely damaged the corn crop. Proper soil and water conservation measures would have saved some of this water for the crop to use during the drought that followed.





The up-and-down rows on this field not only drain off much water that would help the cotton crop withstand a drought, but they also cause severe erosion. Most of the topsoil is gone; the subsoil that remains will not absorb and hold much water. Hence the crops grown on the field suffer drought damage almost every summer.

Saving water during wet periods for possible droughts is just as practical as putting money in the bank for hard times. You may not be able to store all the water that falls during the heavy rains, but you can store much of it through good soil and water conservation measures.

### Conservation—To Help Balance Wet Periods Against Droughts

You can't keep drought from coming, but you can prevent much of the damage when it does come. You can prevent complete crop failures and get fair yields from most crops. You can get some forage from your pastures, ranges, and meadows. You can check dust storms and prevent both wind erosion and water erosion. You may even be able to raise the underground water table on your land and keep the wells and springs flowing during long droughts. You should be able to do all these things and prevent most of the losses that usually come with drought by adopting a conservation program that fits your land and climate.

Soil and water conservation will not eliminate all drought hazards. It will not bring you bumper crops during the driest years. Certainly,

it will not bring more rain. But it should help to balance the wet periods against the droughts.

Your conservation problems will vary according to the kind of land you have and the climate in which you live. On most land, one of your main problems will be to prevent excess runoff during heavy rains. On other land, your chief problem will be to build up the soil so that it will absorb and hold more water. You may need to retire some cropland from cultivation and plant it to grass or trees. On some land you may need to plant crop varieties more resistant to drought.

On wet land, proper drainage during the rainy season may prove valuable in checking later drought damage. On irrigated land, leveling or better irrigating may save you much water during years of low supply. On range land, water-spreading structures, contour furrows, or pitting may be needed. Keeping a reserve supply of feed and forage also is a conservation measure if it will help you to keep from overgrazing your range or pastures during drought.

These and many other conservation measures will help you to check drought damage. Some conservation measures are suitable for almost any type of land in any climate. Others are suitable only on certain types of land in a particular climate. All are valuable when used properly in the right place. But each field or pasture may need different treatments. You must plan your conservation program to fit your land and climate.

### For Sloping Land in Wet Climates

Droughts occur every year in some place that normally has a wet climate. Droughts that come to humid sections are often more costly than droughts that come to dry-farming areas—because the potential value of the crops is greater.

Severe drought damage can usually be prevented in a wet climate if the best soil and water conservation measures are used. We get enough rainfall to raise a crop every year if all the water is available. But, too often, we permit much of it to run off sloping land or we waste it in other ways—water that may be sorely needed if drought follows.

The main things that will help insure crops against drought damage on sloping land in a wet climate are: (1) Use each tract of land for things that it is best suited to—don't try to grow cultivated crops on fields that are suited only for pasture or woodland; (2) build up the soil so that it will absorb and hold more water—you must stop erosion to do this; (3) check runoff when the heavy rains come and store water in the soil for future use; and (4) control the runoff that the





This steep and eroded hillside was planted to a pasture and hay crop because the droughty and unproductive land would not grow cultivated crops profitably. The first and most important step in any soil and water conservation program is to put each field to growing the kind of crop that it is suited to produce.

soil will not absorb and use it at other places on your farm—keep it out of gullies; spread it on pastures, meadows, or woodlands; or store it in farm ponds.

### *Use the Land According to Its Capability*

You are bound to get small yields and frequent crop failures during dry seasons if you try to grow crops that need lots of water on soils that hold little moisture. You are inviting drought damage when you plant clean-tilled crops on steep slopes where it is impossible to prevent a lot of runoff during every rain.

Plant the steep land to trees or grass; you will get less runoff and less drought damage. Plant the shallow, eroded, or droughty soils to pasture, meadow, or other crops that suffer least when dry seasons come. Use only the deeper and drought-resistant soils for cultivated crops where possible. If you must use some shallow or droughty soils for cultivation, choose drought-resistant crops to plant on them—don't try to grow corn, or any crop that uses a lot of water, on a soil that will hold little moisture.

### *Build Up the Soil—To Hold More Water*

Crops begin to suffer sooner during dry weather on some lands than on others. This is usually because “droughty” land does not absorb and hold much water. You have probably noticed that virgin



soils are usually more drought-resistant than are similar soils that have been cultivated for many years. The virgin soils contain more organic matter and have a better granular structure; hence they absorb water faster and hold it for a longer time. Clean cultivation usually causes the soil organic matter to decay rapidly. It often causes tight soils to lose their granular structure and run together; this prevents them from absorbing water rapidly. It may cause sandy soils to become so loose that they will not hold much water.

You can increase the amount of organic matter and improve the granular structure in most run-down soils. You can do this by leaving the stalks, straw, and stubble from the crops on the land—plow them into the topsoil or leave them on top of the ground to form a mulch. Use a good crop rotation that includes frequent sod crops,



This conservation farmer is plowing under a green-manure crop of sweetclover to increase the amount of organic matter and improve the soil structure. This helps to make the soil absorb and hold more water. Hence, crops generally suffer less from drought, provided other conservation practices are used to prevent runoff from the land.





The water standing in the terrace channels and contour lister furrows on this field will go far toward helping produce a good crop if a summer drought follows the heavy spring rains. Conservation practices of this type are especially valuable in saving water and preventing erosion during periods when the ground is bare.

such as grass and legumes. Grow green-manure crops frequently, and spread barnyard manure over the land. These and other conservation practices will help to build up the amount of organic matter and improve the soil structure. This will help to make the soils more drought-resistant.

There is no set formula for increasing the water-holding capacity of a soil. Each tract of land is different and may require a different treatment. It may take several years to build up the water-holding capacity of a run-down soil. But you will get benefits in several ways when you do. Crops will suffer less from drought. Erosion will be checked. And the productivity of the soil will be increased, even in wet years.

### *Store Water in the Soil—Control the Runoff*

You can't use rain water for growing crops if it runs off the land into the creeks and rivers. It is the water that soaks into the ground that helps tide your crops through a drought. Your crops will not

suffer from drought when there is no rain if you have soil moisture stored up from previous rains. But you must check runoff and hold the water on the land before it can soak into the ground.

All sloping land should be tilled on the contour to help check runoff and stop erosion. Terraces are also needed on many fields. Contour strip cropping is needed on many fields, especially those not terraced. Contour tillage and terracing are exceptionally valuable if you get heavy spring rains and summer droughts. These practices help to hold the water that falls in the spring when much of the ground is bare.

There are many other water-conservation practices that are useful on sloping land in a wet climate. Stubble mulching will not only help check runoff; it will also help prevent loss of soil water through evaporation. Good crop rotations and timely tillage will help conserve moisture. On pastures and meadows, contour furrowing, proper grazing, and protection from fire will also help check runoff. Proper woodland management, including protection from fire and grazing, will help conserve water on wooded land. To get the maximum insurance against drought damage, you should use all the water-conservation practices that are adapted to your land.

But even with the best conservation program, you can't always hold every drop of water that falls on the land. During heavy rains, you may get more water than the soil will hold. When a heavy snow melts on frozen ground you cannot prevent some runoff. But you can use much of it at other places on the farm, if you control it properly.

Keep runoff out of gullies and off bare ground. Make it run down a grassed waterway and then spread it over a pasture, meadow, or wooded tract. Some of it will be absorbed by the soil in these areas. Try to store what runoff leaves these areas in ponds. Ponds full of water are useful for many things on a farm and they help reduce flood damage downstream.

Not only will the best water-conservation measures help to insure your crops against drought damage; they may even help to raise the water table on your farm and keep the springs and wells flowing longer during a drought.

### *Feed Reserves*

You are likely to have some short crops during the worst droughts even though you use the best practices. Hence, a well-planned conservation program should provide for reserve supplies of livestock feed and forage. This will give added insurance against loss when the feed crops are short and the cash crops bring in little income.





The water table on this field that was once waterlogged has been lowered to about 24 inches below the ground surface through proper drainage. The crops now make a more rapid early season growth and the roots grow deeper into the soil. Thus the crops are better able to withstand a summer drought if it should come.

### For Wet Land

Drought often causes damage to crops grown on land that normally requires drainage. The excess water in poorly drained soils during wet seasons usually will not help the crops during dry seasons. In fact, the excess water in soil during a wet spring may actually cause damage to crops if a summer drought follows. Plant roots must have air as well as water. Crop roots will not grow into a soil that is saturated with water. If the soil is waterlogged during the early growing season, the crop roots will spread out near the surface instead of growing deep into the soil. Furthermore, the crops will make a slow spring growth because a soil that is wet is usually cold. Shallow-rooted crops that get off to a late start are not able to withstand a summer drought.

Proper drainage is one of the main conservation measures needed to make wet land more drought-resistant. Good drainage will enable crops to make a faster early growth; and the roots will grow deeper into the soil while the plants are young. The crops can then use some subsoil moisture if dry weather exhausts the moisture in the topsoil.

On many wet soils waterlogging or puddling has broken down the granular structure. You can improve most of these wet soils by plow-

ing under green manure, crop residues, or other organic matter. This will help make the soil porous so that air can circulate through it; and it will drain better. The organic matter will also hold some of the water from wet seasons to help tide the crops through a drought. Furthermore, this will make the land easier to cultivate. Most of the other soil-improving practices that are used on sloping land in wet climates will also benefit poorly drained or wet land.

### For Dry-Farming Areas

Drought comes frequently to most dry-farming areas. The damage to crops and livestock does not need to be severe in most cases, however, if the best soil and water conservation measures are used. These measures must be varied for the different kinds of land, systems of farming, and climatic conditions. But the basic principles of conservation are the same for all dry-farming areas.

The main things that will help to insure crops and livestock against drought damage are:

1. Farm to fit the climate—don't try to grow crops that are not adapted to the climate in which you live.
2. Use each tract of land for something it is suited to do—don't try to cultivate land that is suited only for pasture or range.
3. Check runoff during heavy rains—hold all the water on the land where it falls until it soaks into the ground.
4. Improve the soil so that it will absorb and hold more water.
5. Use the water that you store in the soil for crops—don't let weeds use it up or don't lose it through evaporation.
6. Use a flexible cropping system that you can change according to the season—wait until you have moisture in the soil before you plant.
7. Keep extra feed and cash on hand to tide you through drought years.

### *Farm To Fit the Climate*

Ever since the dry-farming areas were settled, we have been trying to push the cropland belt still farther west onto the Great Plains and into other areas of dry climate. Every time we have a period of a few years with more than average rainfall we plow up more grassland and plant it to crops. The wet periods have always been followed by dry periods and much of the new cropland has then been abandoned.

We have made great progress in developing drought-resistant varieties for crops of dry-farming areas. But we still don't have crops that will grow successfully in dry years in some of the areas we are trying to farm. We shall continue to have severe drought damage in these areas until we learn to farm to fit the climate.



Don't try to fit your farming practices to the wet years. Farm according to the amount of rainfall you can expect in an average year—and be prepared for the drier years.

### *Farm To Fit the Land*

A great deal of drought damage in dry-farming areas is caused by trying to farm the wrong kind of land. The capability of the land varies greatly. You can usually grow cultivated crops successfully on the deeper soils that are not too sandy or too tight if you use good soil and water conservation measures. But the shallow soils, the very tight or loose sandy soils, and the steep slopes are normally suited only for pasture or range. Too much of this land has been plowed up for crops in some areas. Many of the crop failures and most of the dust storms and land abandonment of the past came from such land.

Don't plow up the grass on land that is not suited for cultivation—it will make you more money as grazing land in the long run. If you have such land that has already been plowed, you can put it back to grass.



This Great Plains farmer broke out 430 acres of native sod in one season with this tractor and plow. The land was then planted to wheat and other crops. Some farmers, with larger units, have plowed up several thousand acres of sod in one season on the Plains. Some of the sod thus broken out is suitable for growing crops but some of it is not. Several million acres of unsuitable land have been placed in cultivation on the Plains that will be abandoned during the next long drought.



The level terraces on this Great Plains wheatfield are holding all the water that fell during a 3-inch rain. The water held by such terraces during heavy rains may make the difference between a good crop and a crop failure in drought years.

### *Conserve Water*

Water conservation is the best insurance against drought damage in most of the dry-farming areas. You get enough rain to raise a crop during most years if you make the water soak into the ground and keep it there until the crops can use it. Many crops have failed for lack of moisture on land where large amounts of water ran off into the creek a few weeks previously.

Level terraces will stop most of the runoff from cultivated fields. They are especially needed on most of the hardlands and on some of the sandy cropland. Both contour tillage and stubble-mulch tillage will help to check runoff. Stubble-mulch tillage will also help prevent evaporation of water stored in the soil. Many farmers use summer fallow to store up soil moisture. During dry years, you can often save enough water by using conservation practices to make the difference between a fair crop and a crop failure.

### *Improve the Soil*

You can build up the soil so that it will absorb and hold more water—this extra soil moisture may prevent a crop failure. You can keep the soil in a condition that will prevent it from blowing—this may keep a crop from blowing out. There are many soil-building and soil-conserving measures that will help to do these things.

Plow all stalks, stubble, and straw back into the soil or leave them on the top of the ground. They will add organic matter to the soil. This will not only enable it to hold more water but will also improve



the soil structure. Don't ever burn off crop residues. You are inviting crop failure and wind erosion with the first drought if you rob the soil of its organic matter and leave its surface bare and finely powdered. Try to build up the soil instead of tearing it down.

### *Flexible Cropping Plans*

You can't make a good crop every season in most dry-farming areas even though you farm only the best land and use proper water-conservation practices. There won't be enough moisture to make a good crop during the driest seasons. But you needn't have complete crop failures during these seasons. If you keep weeds out, you can store moisture in the soil during the seasons that are too dry to grow a crop—keep it there until the next season and then you may be assured of a good crop even though the weather is still dry.

If the soil is dry at the time you usually plant a small-grain crop in the fall, don't plant it! Maybe you will get some good winter or spring rains or snows and maybe you won't. If you don't the crop will probably not make enough to pay the expense of growing it. If you do, you can plant in the spring and be pretty sure to get a good crop.



This Great Plains sorghum crop, planted in double contour rows 7 feet apart, produced a good grain and forage crop during a year of severe drought. The farmer usually plants this field to winter wheat. But his soil was dry at wheat-planting time, so he conserved all the winter rain and snow and waited until spring to plant this sorghum. The result was this good crop. Most of his neighbors who planted wheat in the fall had complete crop failures.

If the soil is dry when it is time to plant a spring crop, wait for possible summer rains. If they come, you can plant a summer or fall crop. Experience has shown that it seldom pays to plant a crop in dry soil in most dry-farming areas.

But when you have soil moisture, plant a crop! Don't wait any longer than necessary; you are likely to waste some of the water if you don't plant a crop to use it.

You must have a flexible cropping plan to follow this system. You must always be prepared either to plant a crop or to wait. If your soil is likely to blow, you should keep some type of plant cover on the land while you wait. And, you should always keep enough feed on hand to carry your livestock through a drought year. Feed reserves will make it possible to hold your stock for a favorable market if you have a crop failure. And you will not be forced to graze the stalk and stubble fields so closely that they are likely to blow.

### For Semiarid Range Land

Drought comes so frequently to the semiarid range areas of the West that no rancher can depend upon having enough moisture for any given season. And when drought comes, it may last for months or even years. Every rancher must be prepared for drought at all times if he expects to avoid serious financial losses and probable damage to his range when it strikes.

The relatively short droughts, those that last only a few months, seldom cause much damage to the range or to the land. But they may cause serious financial losses on livestock to the stockman who is not prepared for them. The long droughts, which do not come so often but sometimes last for several years, not only cause serious financial losses on livestock; they may also cause permanent or long-term damage to the range or to the land.

You can eliminate practically all the damage to your range and much of the financial loss on livestock that usually come with droughts through a good range-conservation program. The main conservation measures that will help to cut down drought damages on the semiarid range land may be grouped into four classes: (1) Proper grazing, (2) maintaining feed reserves, (3) water conservation, and (4) reseeding depleted ranges.

### *Graze Properly*

Drought itself will seldom kill many of the range plants or severely damage a well-managed range. But heavy grazing during a drought will almost certainly kill many of the best range plants—it may





The range to the left of the fence has been overgrazed. It now produces little forage and many of the grass plants will die if a severe drought comes. The range to the right has been moderately grazed and given occasional rests. It is in good condition to withstand a drought and produces much more forage during good years than does the overgrazed range.

greatly reduce the grazing capacity of the range for several years after the drought ends. Heavy grazing during the wet years may cause serious damage to a range if a severe drought follows—grass plants that have been grazed too heavily during the good years will not have the vitality needed to withstand a long drought and many of them will die. Your range-conservation program should provide for moderate grazing during normal years, and it should provide for reduced grazing during drought years.

Proper grazing of a range involves many things, whether it be during a wet year or a drought year. You are not necessarily practicing good range conservation just because you limit the number of grazing animals to the normal carrying capacity of the range. You should graze each tract of land according to the kind, number, and condition of forage plants on it at that particular time.

Grazing at the right time is important. Some pastures should be grazed only in the spring or in the fall. Others may best be grazed during the summer. Some make good winter ranges; others do not. And practically all ranges need an occasional rest if they are to reseed themselves and stay in a healthy condition.

Your grazing system should provide for the grazing of each pasture at the best time, insofar as possible—this will greatly increase the



These stacks of hay, on a Nevada ranch, furnish forage to supplement the range during winter months or during a drought. This will help the rancher go through a drought year without much loss of profits on his livestock. And he is also able to graze his range lightly during a drought and thus prevent severe damage to the range and to the land.

forage yields at all times and will leave the range in condition to best withstand a drought. And you should keep the livestock distributed more or less evenly over the various ranges if you expect to get the most forage with the least damage to the land. A good system of rotation grazing will usually help you to accomplish these ends.

You may need to build more fences or to move some of the fences you now have in order to divide up your range land for the best use. Each pasture should have similar types of forage and similar capability over most of its area if you expect to get even distribution of grazing. The location of watering places, salt licks, and feeding places will also affect grazing distribution. But the most important thing in proper grazing is to adjust the number of animals grazed to the capacity of the range at all times. This means that you should be prepared to reduce the number of animals grazed on any range that you find is being overgrazed—you must be ready to reduce the number on all your ranges when a severe drought comes.

### *Maintain Feed and Forage Reserves*

Grass growth will be less on the ranges during droughts. The feed and hay crops will also produce less. Hence the number of livestock you keep must be reduced when drought comes, unless you have reserve supplies of feed and forage that you have saved from



better years. If you have grazed a part of the range lightly, you should have some reserve forage on it that will help you to cut down the grazing load on other ranges. Having large reserves of feed—either hay, bundle feed, silage, or grain—will help you cut down the grazing load on the range without causing undue losses on your livestock. But the forage or feed reserves must be built up during the good years—it will be too late after drought strikes.

If you don't have reserve supplies of feed or forage on hand, you may be forced to sell a large number of livestock when a long drought comes. The prices for livestock will probably be low and feed prices high if the drought extends over a large area. But if you have more livestock than your range will support and don't have feed reserves, you will probably do better by selling some of the stock even on a poor market. If you try to hold them on an overstocked range they will lose weight and they may damage the range for years to come.

### *Conserve Water*

A thick stand of grass on the ground will probably do more than anything else to check runoff from range land. But during the heaviest rains some water will run off even a well-sodded range. Structures of some kind are needed in many places. Many types of diversion terraces and water spreaders have been used successfully on the western ranges. The most popular type of structure is a diversion terrace that catches water on a steep slope, diverts it to a gentle slope, and spreads it over the grass. Contour furrows and pitting have proved successful in checking runoff on many ranges.

Each tract of land will probably require a different type of treatment. The main thing is to determine which water-conserving structures will do best on your land, then build them. You should build the water-conserving structures during the wet years. Then you will be prepared for drought before it comes.

### *Reseed Depleted Ranges*

You can greatly increase the forage growth on many ranges by planting grass on them. It is often more economical to plant grass on a depleted range than to wait for the range to be reseeded naturally. Furthermore, you can plant grasses that will yield more forage than the native grasses on many ranges; and some of the grasses that you plant may be more drought-resistant than the grass now growing on the range. Good seedbed preparation, use of the kind of grass best adapted to your locality, and protection from grazing until the grass gets a good start will pay you well.



This is a field of crested wheatgrass in Wyoming that was formerly planted to wheat. The land was broken out and farmed for several years, but with the first long drought it was found not suitable for cropping. The owner retired it from cultivation and returned it to range. The crested wheatgrass produces more forage than the native grass that originally grew here.

### For Irrigated Land

The irrigation farmer does not have to depend on the amount of soil moisture at planting time or the amount of rain and snow that falls during the growing season. Nevertheless, drought may seriously affect his farming operations. Most irrigation farmers depend mainly on the water they get through irrigation canals. This is usually determined by the amount of winter snow and spring rain that falls on the watershed that supplies the irrigation canals. A general drought over most of a watershed may seriously deplete the amount of water available for the next crop season.

You can avoid most of the losses that usually come when drought causes a short water supply by using the best cropping plans and the best soil and water conservation measures. Furthermore, you can increase your yields and decrease your water bill during normal years.

You can usually find out about how much irrigation water you can get for a coming season before it is time to plant your crops. Government reports compiled from snow surveys on watersheds and



water measurements in reservoirs give this information. This should help you to make cropping plans each year that will fit the water supply for that season.

If advance reports show that the water supply for your area is going to be short, you should plan accordingly. You may wish to plant crops that do not require so much water; or you may wish to leave a part of the land fallow for the season. Your total yields will probably be greater and your net profits are almost certain to be greater if you plant only the kinds and acreage of crops that you can irrigate properly.

Large savings of water can often be made through proper conservation measures. By land leveling, some irrigation farmers have saved more than half the water formerly used. Others have greatly reduced the amount of water needed by improving their methods of irrigation. The substitution of borders and corrugations for flooding has saved much water for many farmers. Improving irrigation canals and canal linings and water-diversion systems may also bring large savings in water. And the same types of soil-building practices that help to make nonirrigated lands more drought-resistant will do the same thing for most irrigated lands.



Much irrigation water is wasted on this field because the land has not been properly leveled. The low spots in each plot get too much water, whereas the high spots do not get enough. This waste of water may result in a great loss in crop yields during years when drought causes a shortage of irrigation water.

## Conservation Pays—Doubly During Drought

Soil and water conservation pays large dividends in many ways—it saves the soil for future use and increases the value of the land; it increases the yield and quality of crops produced almost every year; but one of its greatest values is the insurance it gives to farmers and stockmen against drought damage. It is during the drought years that conservation pays its largest dividends in greater yields.

Conservation farming on thousands of farms throughout the United States has caused an average increase in yields of more than 30 percent. The average increase has been much greater during drought years. Some farmers have reported yields that were 100 to 1,000 percent greater than on neighboring farms where water and soil had been permitted to run off.

Wheat farmers of the Great Plains have doubled and tripled their expected yields during dry years through contouring, terracing, stubble mulching, summer fallow, and other conservation practices. Throughout the Corn Belt, farmers have boosted their yields of corn and other crops with contour tillage, strip cropping, crop rotation,



This Illinois corn farmer is harvesting a bumper crop from a contour-planted field. He also has been using soil-building and other water-conservation practices. His yields have been increased during normal years; but he says that the greatest benefits from his soil and water conservation program come during the drought years.



and green manuring. The same is true of cotton farmers of the Southeast, orchardists, and truck farmers. Many ranchers of the West have reported grass yields 25 to 50 percent greater during dry years, where deferred and rotation grazing, water spreading, and other needed conservation measures were used than where such measures were not used.

One of the main reasons conservation practices are so valuable during droughts is because of the soil moisture they help to store during the wet periods. For example, when heavy spring rains broke a 5- to 7-year drought in central and western Texas in 1957, tests showed that fields and pastures with good cover or conservation treatment held about twice as much moisture as unprotected ones. To make these tests, SCS technicians in 120 work units dug holes or made borings into the drought-parched soil to see how deep the soil was moist.

These tests included 133 paired observations as follows: On 40 cropland fields with conservation treatment the soil was moist to an average depth of 59 inches and on 40 similar fields without conservation treatment the moisture depth was only 36 inches. On 93 pastures and ranges with good cover or conservation treatment the soil was moist to an average depth of 37 inches and on 93 similar pastures and ranges with poor cover and no treatment the average moisture depth was only 13 inches.

When a summer drought struck most of these areas a few months later, the moisture stored in the soil meant the difference between a fair crop and a crop failure or a good crop and a poor crop. In other words, conservation farming and ranching helped balance the wet spells against the droughts.

### Long-Time Conservation Plans

Contouring, terracing, mulching, and other water-holding practices give some immediate relief from a short drought. Crop rotations, green manuring, and other soil-building practices should give increased yields and some drought relief within a few years from the time they are started. But you must have a long-range program to get full benefits from your soil-building and water-conserving practices.

You must put each tract of land to its proper use and build up the water-absorbing and water-holding ability of the soil to get your land in shape to produce profitably during a long drought. This calls for a long-time conservation plan—a plan that you have worked out carefully and in detail—a plan that fits the capability of your land. You may need technical help in making such a detailed conservation farm plan. If you live in a soil conservation district, you can usually get such help from that district.



Harvesting small grain on a contour stripcropped field in Wisconsin. Contour stripcropping helps to hold the water where it falls, thus storing it for the future use of crops during a drought.

## Soil Conservation Districts

Farmers of the Nation have organized more than 2,775 soil conservation districts (January 1958). These districts include more than 90 percent of all the farms and ranches of the Nation. Each of them helps any farmer or rancher who applies for help to make his conservation farm or ranch plan. It is based on a land-capability map made from a soil survey of the farm or ranch.

The land and the climate are the basic things considered in making the plan; but the needs and desires of the farmer or rancher are also considered. Such a plan is made to serve as a blueprint for a long-range conservation-farming program. It is designed not only to prevent soil erosion but also to increase crop yields and to check drought damage. It takes a well-planned program of this type to do the job and make conservation farming the best insurance against drought.